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ABSTRACT

An evaluation plan based on the STAR (Sensible Technology Assessment/Research) model will be used to evaluate the Apple Classroom of Tomorrow (ACOT). Visits to three ACOT schools and interviews with their teachers, students, and administrators were used to obtain an initial understanding of what ACOT means to the process and outcomes of participating classrooms, and of what initial indicators will enable researchers to better understand ACOT effects. The following general findings common to all three sites will serve as a basis for the evaluation plan: (1) participants spoke of the enhanced opportunities for individualized instruction; (2) teachers commented on improvements in both the quality and quantity of students' writing resulting from the ACOT experience; (3) students, administrators, and teachers spoke of the strong and positive effect of the ACOT experience on students' attitudes towards school; (4) teachers and administrators spoke of the changes in students' problem-solving abilities as a result of the ACOT experience, but had difficulty articulating the nature of the changes; (5) teachers noted dramatic increases in the amount of spontaneous peer teaching and cooperative learning; (6) changes in teachers' roles and instructional planning and goals were also noted; (7) teachers were surprised at what students were able to accomplish with the computers, and both teachers and students had grown in their feelings of confidence; and (8) both teachers and administrators spoke of the positive home-school communications brought about by the ACOT experience. Several possibly negative findings include teacher burnout, curricular imbalance, too much emphasis on the play or fun aspect of computer learning, and feelings of deprivation after students leave the ACOT environment and return to traditional classrooms. (EW)

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THE FACES OF MEANING: TEACHERS', ADMINISTRATORS', AND STUDENTS' VIEWS OF THE EFFECTS OF ACOT

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Paper presented at the annual meetings of the American Educational Research Association and the International Association for Computing in Education, 1988.

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The Faces of Meaning: What Do Teachers, Students and Administrators Think is Happening in ACOT

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Eva's paper has described the STAR (Sensible Technology Assessment/Research) Model which underlies our evaluation of the Apple Classroom of Tomorrow (ACOT). The evaluation features a comprehensive and eclectic approach to assessing the effects of ACOT on student performance and to exploring its impact on the teaching and learning process in participating classrooms. Some critical features of our plan include:

collection and analysis of a variety of potential student outcomes;

collection and analysis of such information over time;

collection and analysis of important instructional process and other school context variables that help to explain outcomes;

use of multiple indicators of key outcomes to strengthen the validity of findings;

combining the strengths of both quantitative and qualitative methodologies;

providing uniform data collection strategies and core measures across the diverse ACOT sites but reserving places for interests, measures and effects unique to each site;

completing an iterative and interactive design-analysis-and reporting process to assure the evaluation's sensitivity to the operation and perceived effects in local sites.

But most importantly, STAR's implementation depends on our initial understanding of what ACOT means to the process and outcomes of participating classrooms and of what initial indicators will enable us to better understand ACOT effects. Site visits to three ACOT schools, representing primary, upper elementary and secondary grade levels, were directed toward these issues. The site visits included classroom observations and interviews with teachers, students, and administrators. Despite disparities in grade levels and types of populations served, in hardware and software used, and in instructional philosophies, the three sites, in the eyes of their participants, shared common effects. These

commonalities, briefly summarized below, form the initial set of targets for our evaluation plan.

What do participants see as the effects of ACOT on students?

Interviews with ACOT teachers, coordinators, and administrators as well as on-site observation suggest a common core of outcomes which are of interest and applicable across the sites.

1. Student achievement in basic academic skills: Participants at each of the ACOT schools spoke of the enhanced opportunity for individualized instruction offered by computer technology. Each site was implementing, or planning to implement, automated instructional information systems which tracked students' progress and test scores over the course of the year, and each site also was implementing CAI programs which provided practice with instant feedback in basic skills. The high school, in fact, finding no off-the-shelf programs to meet their management and practice with feedback needs, designed their own program to accomplish these functions. Although such basic skills instruction was by no means a first priority in all sites, most teachers and administrators expected to see ACOT effects on students in this area -- and certainly district administrators and the public were looking for gains in the seemingly all consuming standardized tests scores..

(Our analyses of student performance on standardized achievement measures for the ACOT evaluation will include longitudinal and cross-sectional approaches, comparing ACOT students to themselves before, during and subsequent to the ACOT experience and comparing the performance of ACOT students with similar students at each site who have not experienced ACOT and with similar students at another school in their districts.)

2. Student writing: All teachers commented on improvements in the quality and quantity of student writing resulting from the ACOT experience, changes which Eva mentioned. The productivity effects in this area are demonstrated in an empirical study conducted at the primary grade site. Students were asked to complete both one minute printing and handwriting samples; their speed in these tasks was then compared to their keyboarding speed. Results indicated that the third graders printed at an average of nine words a minute and wrote cursively at a rate of seven words a minute. In comparison, by the Spring, these same students typed at an average speed of 25 words per minute with 95% accuracy -- in other words at about three times the rate that they could manually produce text.

Teachers at this and other sites agreed that freeing children from the cumbersome physical process of writing and

enabling them to revise easily and without penalty was a tremendous advantage. Students became more open to experimentation and revision and were able to focus their energy on thinking, organizing, processing and refining their thoughts.

Automating the physical production process not only makes children more willing to revise, but according to some teachers also makes them more willing to share their products. While some thought that this occurred because it was easy for students to read what was on their peers' screen (as opposed to uneven handwriting quality), others commented that this was part of a larger effect of ACOT on students' willingness to share and accept criticism (see below).

(Changes in students' writing will be explored using CSE developed and validated analytic scoring scales. The scales provide diagnostic as well as summary information about the quality of students' writing performance and enable schools to analyze the strengths and weaknesses of their writing instruction and of individual students. The scales were the basis for the IEA (international) study of students' writing as well as the basis for a number of state and local assessments. Not only do well defined and reliable procedures for training scorers (teachers) and scoring student essays exist, but use of the prompts from from the international study will enable us to compare ACOT student performance with national and international samples.)

(The writing assessment will be used not only to assess the quality student writing qua writing but also to gather additional data on the nature of ACOT effects. That is, by asking some students within each classroom to write about the effects of their ACOT experience (or of their school year), about their their plans/expectations for the future, etc. and doing content analyses of responses over time and between ACOT and non-ACOT students, we will have an interesting and flexible tool to examine in depth a variety of outcome related issues.)

3. Attitudes toward school/motivation for schooling. Like the writing area, teachers, administrators, and students' consistently spoke of the strong effects of ACOT on students attitudes toward school. They saw this evidenced in student attendance. Further, teachers at several sites mentioned that their students liked to stay after school to work together on their computers and they "had to pull the power plug" to get students to go home. Asked to comment about how they felt about school this year in the ACOT environment, students offered comments such as:

"I don't like to miss school."

"I feel so lucky!"

"School's much more fun now."

(Our evaluation will track student attendance in ACOT and non-ACOT classrooms and will also administer several measures of attitudes toward school, both commercially published and newer theory-based research instruments.)

4. Locus of Control and attitudes toward self. The sense of empowerment, efficacy and confidence students gained from their experiences with computers was stressed across sites. Most vivid are some of the comments from students at the Memphis site:

"I found out that I have something in my head and that I can use it."

"The thing is, you can do almost anything you want to do."

"It makes me feel more confident because most grown people don't even know how to use a computer."

And as one parent poignantly put it, "ACOT is saying you have a chance in life."

(Like the attitude toward school measures, we will be using newer theory-based instruments as well as more established measures to assess self concept and locus of control.)

5. Problem-solving: Teachers and coordinators at each site spoke about changes in students' problem solving that they thought attributable to the ACOT experience. However, they had difficulty in articulating the nature of the changes they saw. For some, improvements in problemsolving seemed to mean changes in students' independence and their willingness to try solve problems before running to the teacher for help; for others it seemed to mean evidence of more strategic thinking, e.g., systematic approaches to solving problems, troubleshooting alternatives, etc.

For still others, problem solving in ACOT meant that students had the tools, like in writing, that enabled them both to focus on thinking, analyzing and organizing and to "unleash their creativity."

(During phase I of the evaluation, we will be further investigating the appropriateness of available problemsolving measures while we gather additional qualitative data about the nature of apparent changes We shall be looking for both cognitive and affective components

in this area, i.e., measures of how student solve problems and potential problem solving consequences of work with spread sheets, data bases, etc. as well their their willingness approach complex problems and to troubleshoot and explore alternative solutions before asking for help; further one might expect data base and spread sheet work to influence analysis skills. It may well be that different ACOT projects influence different kinds of problem-solving skills and that therefore different types of measures will be required for the various sites.)

How does the ACOT configuration/computer saturation influence the organization & delivery of instruction?

1. Degree of individualization. As mentioned above, all sites mentioned dramatic differences in their abilities to individualize instruction and allow students to work at their own pace. Electronic worksheets with engaging graphics and sound were widely (but not exclusively) in evidence at all sites as well electronic gradebooks and student progress monitoring systems.

The electronic worksheets, according to some teachers, not only provided motivating practice with feedback, but freed teachers to spend more time in one-on-one interactions with students. Several noted an interesting side effect of computer-delivered feedback: apparently some students have an easier time accepting correction from a computer than from a teacher or parent.

Other interesting aspects of individualized instruction in ACOT involves enabling students to utilize their special talents and offering them alternative instructional paths, individual pacing and alternative ways to demonstrate progress. The ACOT technology has made some students, who had previously not performed well on traditional academic tasks, "new stars."

2. Peer Tutoring/Cooperative Learning. Across all sites, teacher mentioned dramatic increases in the amount of spontaneous peer teaching. Part of the change, they said, occurred because the computer venture was so new to most: everyone required help in some area, and teachers were not the sole -- or even necessarily the best -- repository of assistance. (The "new stars" and newly acknowledged computer/ graphics/ software/ or communication "student experts" provided vital assistance -- and "the kids loved helping and teaching each other").

The environmental demands of the new technology, in short, pressed toward students helping each other, rather than relying solely on the teacher. Further, the easy visibility of computer screens and an increased willingness to revise seems to encourage students to share their work.

According to several teachers, peer editing and cooperative learning seem to occur spontaneously.

3. Changes in Teacher Role. The capacity for individualized instruction, the power of new technological applications, the ease of cooperative learning, as well as expanding expectations for students, seem to have resulted in dramatic "Ahahs!" for teachers that have changed their conceptions of their roles. As two teachers put it,

> "The ACOT experience has allowed me to change my role from the traditional teacher to a facilitator, providing an environment in which children can grow and learn at more individual rates."

> "ACOT has allowed me to put away some of the traditional ideas of education....the teacher has the most important role possible. The teacher orchestrates the total learning environment."

4. Changes in instructional planning and goals. The facilitator role apparently brings with it some changes in instructional planning. According to another teacher, "ACOT has changed the way I think about teaching. No longer am I tied to the textbook. I'm using a more skill-based approach, using the text as just a resource, not the resource. I've broadened my expectations for students and I'm now thinking how students can use the computer as thinking tools and become more independent".

How does ACOT affect teachers?

1. Expectations. Changes in teachers' roles and in their expectations for students have already been mentioned. The expectation issue deserves special emphasis: across site after site, almost everyone expressed surprise and delight at what students were able to accomplish with their computers. They learned in hours and days what teachers thought would take weeks and even months. Students' productivity and creativity were noted often. As one administrator aptly put it, "I have learned that third graders are capable of infinite possibilities."

2. Efficacy and sense of professionalism. Teachers as well as students seem to have grown in their feelings of competence. A number of teachers expressed great enthusiasm in this area:

> "never have I done so much thinking and wondering ...taken such delight in watching children grow and learn; or felt such accomplishment and satisfaction."

> "It's lots more work, but it helps to put the excitement back in teaching."

"ACOT means lots more 'wows' for teachers!"

3. Collaboration among teachers. Like the spontaneous peer teaching among students, the massive innovation in the ACOT environment seems to have pressed teachers toward greater collaboration and joint planning. This was particularly apparent in the high school level where such cross disciplinary and collaborative efforts are unusual.

How does ACOT affect home-school relations?

Teachers and administrators at several schools mentioned that ACOT had opened two-way, positive communication between school and home (literally true thanks to home modems at one site). They spoke of greater parent involvement and interest in their children's school work, better attendance at school events, greater willingess to help and volunteer, and more positive attitudes toward the school, including greater apparent comfort in visiting the school and dealing with school staff.

Aren't There Any Down Sides?

Of course. And the evaluation will be attentive to trying to detect them. A few potential concerns already stand out:

1. Teacher burnout. While the teachers we spoke with feel great satisfaction in their accomplishments in ACOT, there is no doubt that they a putting in enormous amounts of time and energy, "running as fast as I can just to keep up."

2. Curricular balance. There was concern at several sites that computer literacy & keyboarding skill development is coming at the expense of other curriculum areas; at the elementary school level, there was particular concern that the paucity of software in science and social studies may cause these subjects to get shortchanged.

3. Combining work and play -- it's fun and it feels good, but does it become too much?. It is clear that students in ACOT classrooms are enjoying themselves and feeling good about school, important consequences in fostering learning. But a cynic might wonder whether these same students are spending enough time in learning the academic skills that will enable them to meet their heigtened expectations. Similarly, spontaneous peer coaching and cooperative learning are valuable outcomes, but there is a point at which such activities detract from rather than contribute to time on task. In the words of one district cynic, "Kids find new ways to get out of doing things."

4. Deprivation after ACOT. There was tremendous concern across sites, but particularly at the inner-city site, about what happens to students after they leave the ACOT environment and have to re-enter more traditional classrooms. Will they feel deprived and frustrated? What will be the long term effects of relative deprivation on attitudes toward school, persistence, and learning?

ACOT explores the possibilities of computer saturation. CSE's evaluation seeks to assess which of these comes to fruition. This year's effort makes a first cut at what's happening, a cut that will be refined as both we and ACOT implementers gain experience with the experiment.